MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

TPL 2141 – PROGRAMMING LANGUAGE CONCEPT

(All sections / Groups)

16 OCTOBER 2017
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 pages (excluding cover page) with 5 Questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided

Question 1

(a) Given two sample codes of programming languages.

```
<!DOCTYPE html>
<html>
<body>
<?php
   echo "My first script!";
?>
</body>
</html>
```

Language 1

```
(defun Hello (x)
  (* x x)
)

(Hello 10)
(write-line "I am learning
functions")
```

Language 2

(i) Both of the programming languages have been used in different application domains. Identify the programming language indicated in Language 1 and 2. Discuss the application domain that is suitable for applying Language 1 and 2.

(ii) According to the technical advisor of company ABC, Language 2 is less readable and is more costly than Language 1. Describe the characteristic of the both languages in terms of readability and cost.

[3 + 2 = 5 marks]

(b) There is an analogy trying to describe the comparison between compilation and pure interpretation methods, as stated below.
Compilation is like translating a French knitting pattern into English, then reading the English. Interpretation is like using a French dictionary on each word in turn as you knit.

(i) Discuss FOUR (4) differences between compilation and pure interpretation in terms of program processing, execution and memory allocation.

(ii) The execution time for compilation method is faster than pure interpretation method. Why pure interpretation is an acceptable implementation method for several recent scripting languages?

[4 + 1 = 5 marks]

Continued .....

Question 2

Consider the following grammar with start symbol `<float>` and terminals: `'-', '.', '0','1','2','3','4','5','6','7','8','9'`

```
<float>    → - <num> | <num>
<num>      → <digits>| <digits> . <digits>
<digits>   → <digit>| <digit> <digits>
<digit>    → 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
```

(a) Show the derivation (without using parse tree) for sentence: `-45.32`

[3 marks]

(b) Describe the language defined by the above grammar in English.

[1 mark]

(c) Construct syntax diagram for all the rules in the above grammar.

[4 marks]

(d) Convert the above grammar into Extended Backus-Naur Form.

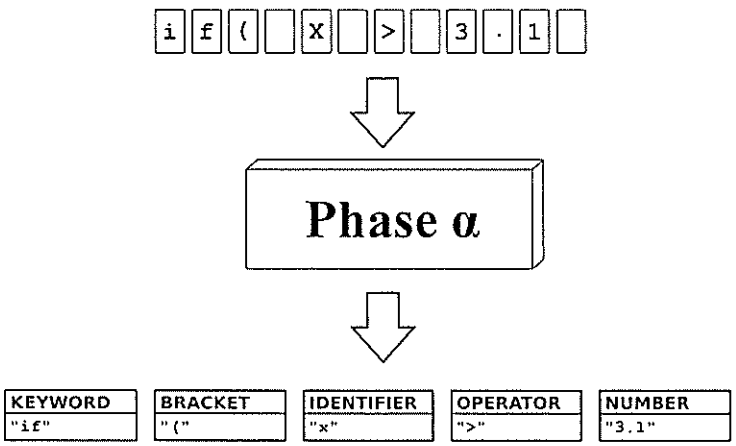
[2 marks]

Question 3

(a) Most programming languages exhibit a phase distinction between the static and dynamic phases of processing semantics.
   (i) Discuss the differences between static and dynamic semantics.
   (ii) Provide an operational semantics definition for any iteration control structure.

[2 + 2 = 4 marks]

(b) Given the following diagram that is related to the first phase of the compilation process:



   (i) Describe the functions that are happening in phase α and its purpose in the compilation process.
   (ii) If phase α is based on C++, draw a state transition diagram that is able to recognize the correct syntax of an *`if`*-statement.

[3 + 3 = 6 marks]

Continued .....

Question 4

(a) Given the following C code snippet:

```
int apple = 0;
float boy = 4.5;
int *car = &apple;
apple = 1 + boy;
```

(i) Bindings can happen during language design time, compile time and run time. Using the given code, discuss the processes that took place during each binding time.

(ii) Find out the mixed-mode expression from the above code. What is the type of conversion that can possibly happen to the mixed-mode expression? Explain.

[3 + 2 = 5 marks]

(b) Two junior programmers are arguing on the output of the Python code snippet:
Mark: "Function `x()` should print `4`!"
Bill: "No, I don't think so. It should print `3`!"

```
line 1      def x():
line 2          print(i)    # x uses i

line 3      def y():
line 4          i = 3       # y defines i
line 5          x()

line 6      i = 4           # outer program defines i
line 7      y()
```

What is your opinion on the answers given by Mark and Bill? Discuss both of the outputs based on the static and dynamic scoping.

[3 marks]

(c) Disallowing functional side effects in the imperative languages is difficult because it eliminates some flexibility of operand evaluation order for the programmer. Explain with a sample code to show the functional side effects problem that arise in the operand evaluation order.

[2 marks]

Continued .....

Question 5

(a) A selection statement provides the means of choosing between two or more paths of execution. Given the following pseudocode that generally represents the nesting selectors for an `if-else`-statement.

```
if sum == 0
if count == 0
result = 0
else
result = 1
```

(i) How do you interpret the meaning of the nested selectors?

(ii) Rewrite the pseudocode with TWO (2) different programming languages to produce the same output.

[2 + 2 = 4 marks]

(b) Analyse the following pseudocode:

```
begin
    integer n
    procedure p(k: integer)
        begin
            n := n+1
            k := k+4
            print(n)
        end
    n := 0
    p(n)
    print(n)
end;
```

Compute the value of **n** and **k** based on passed by value, passed by reference and passed by value-result.

[3 marks]

(c) Counter-controlled loop, logically-controlled loop and user-located loop control mechanisms are specifically designed for iterative statement. Explain the differences among them by providing sample codes.

[3 marks]

End of Page